

PEDAGOGY

Effectiveness of the Practice Style and Reciprocal Style of Teaching: A Meta-Analysis

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Abstract

The purpose of this meta-analysis was to examine the effectiveness of Mosston and Ashworth's (2008) practice and reciprocal styles of teaching on motor skill acquisition of school-age and university students. A systematic search in bibliographical databases led to the identification of 23 relevant studies published in peer-reviewed journals. Using certain methodological and statistical criteria, we retained six studies for further analysis. We estimated proper effect size statistics for each study and teaching style. Heterogeneity of the effect sizes was almost zero for the reciprocal style and moderate to large for the practice style ($I^2 > 50\%$). Both teaching styles appear to produce large effects, with the practice style (mean $d = 1.16$) having larger effects than the reciprocal style (mean $d = 0.94$). This meta-analysis provides an overview and synthesis of relevant studies and highlights both teaching styles for increasing K–12 and university students' motor skill learning. The results are discussed in light of the Spectrum theory.

The Spectrum of Teaching Styles (Mosston & Ashworth, 2008) is a pedagogical theory that provides a solid model for the systematic generation of research questions and for the organization of relevant results. According to Mosston and Ashworth (2008), the Spectrum consists of a continuum of 11 landmark styles. The styles can be

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clustered into either reproduction or production. The reproduction styles include the command style, practice style, reciprocal style, self-check style, and inclusion style. In reproduction styles, the purpose of the instruction is the replication of specific known skills and knowledge. The teacher specifies the subject matter of the lessons, indicates the learning conditions by identifying the teaching style, and defines the criteria for correct task completion. The class climate is one of performing the model, repeating the task, and reducing errors (Mosston & Ashworth, 2008).

The production styles include the guided discovery style, convergent discovery style, divergent discovery style, individual program, learner-initiated style, and self-teaching style. The production styles require students' engagement in cognitive operations, such as problem solving, inventing, comparing, contrasting, and synthesizing. The class climate favors patience and tolerance and individual cognitive and emotional differences (Mosston & Ashworth, 2008).

The transition from one landmark style to another represents certain decisions being shifted between teacher and learner. The decisions are organized into three mutually exclusive sets: (a) pre-impact; (b) impact; (c) post-impact. The pre-impact set contains decision categories such as objective of the lesson, selection of a teaching style, subject matter, class climate, where to teach, organizational arrangements, evaluative procedures, and time (e.g., starting and stopping time). The impact set contains the decision categories of implementing the pre-impact decisions and adjusting them if needed. The post-impact set contains the decision categories of gathering information about the performance of the learners, assessing performance against criteria, providing feedback to the learners, and assessing the selected teaching style (Mosston & Ashworth, 2008).

This study examined two of the reproduction teaching styles: the practice style and the reciprocal style (the rationale for selecting these two styles is given in the Method section). Because all readers may not be familiar with these styles, an overview of them is given.

The practice style is the first in the Spectrum that involves the student in the decision-making process (Mosston & Ashworth, 2008). Nine decisions of the pre-impact set can be shifted to the learner: posture (how to posture for the task), location (where to

locate in the environment), order of tasks, starting time per task, pace and rhythm (how quickly to perform the task), stopping time per task, interval (the time between two tasks or parts of tasks), attire and appearance, and initiating questions for clarifications (when to ask questions about the task). The teacher makes the rest of the pre-impact set decisions, as well as all of the post-impact set decisions. During practice, the teacher observes the performance of each student, offers him or her individual and private feedback, and is available to answer relevant questions (Mosston & Ashworth, 2008).

In the reciprocal style, learners are organized in pairs with each learner assigned a specific role. One learner is the doer who performs the task and the other is the observer who offers immediate and ongoing feedback to the doer using a criteria sheet designed by the teacher. At the end of the practice, the doer and the observer switch roles (Mosston & Ashworth, 2008). Mosston and Ashworth (2008) argued that certain strengths can be realized in this style of teaching: (a) Learners learn to give feedback to a peer, which results in a higher number of correct responses by the doer because of the increased frequency of feedback provided by the observer; (b) learners learn to give and receive feedback with a peer, which results in an expansion of learner socialization skill; and (c) learners learn to perform and analyze movements by observing the performance of the doer, comparing the performance against criteria, and drawing conclusions about the accuracy of the performance.

In both styles, students make the nine aforementioned pre-impact decisions. However, unlike the practice style, learners in the reciprocal style have to make three additional decisions (i.e., gathering information about the performance of the doer, assessing the doer's performance against criteria, providing feedback to the doer). In addition to the decisions made by the teacher in the practice style, the teacher in the reciprocal style designs the criteria sheet, monitors and communicates with the observer, and offers him or her feedback about the observer's role.

The two teaching styles in question have drawn the attention of many researchers over the years. Byra's (2000) and Chatoupis' (2009) narrative reviews on the Spectrum of Teaching Styles show that the practice and reciprocal styles are effective in promoting motor skill development over time. Some of the skills tested in the reviewed studies were the forearm pass; accuracy in hockey and rifle shooting;

soccer ball juggling; and volleyball spike, passing, serving, and setting. Although the results of these two reviews are valuable to physical education (PE) teachers and researchers, they do not provide the pooling of data among studies that can be analyzed statistically and the summation of the results by means of appropriate statistics (e.g., effect size) used to assess these results.

Table 1
Excluded Studies

Excluded study	Reasons for exclusion	Review paper^a
Mariani (1970)	Teaching style implementation was not systematically verified	Byra (2000)
Griffey (1983)	Teaching style implementation was not systematically verified; did not contain the necessary statistics to calculate effect size	Byra (2000); Chatoupis (2009)
Virgilio (1984)	Compared landmark objectives of one style against a different style ; did not employ an equivalent group design	Chatoupis (2009)
Golberger & Gerney (1986)	Did not contain the necessary statistics to calculate effect size	Byra (2000); Chatoupis (2009)
Goldberger & Gerney (1990)	Did not employ an equivalent group design	Byra (2000); Chatoupis (2009)
Oosthuizen & Griesel (1992)	Written in a language other than English	Chatoupis (2009)
Harrison, Fellingham, Buck, & Pellett (1995)	Teaching style implementation was not systematically verified; did not contain the necessary statistics to calculate effect size	Chatoupis (2009)
Liu (1997)	Written in a language other than English	–

Table 1 (cont.)

Excluded study	Reasons for exclusion	Review paper^a
Hein & Kivimets (2000)	Examined reproduction against production teaching styles; teaching style implementation was not systematically verified	Chatoupis (2009)
AlMulla-Abdullah (2003)	Compared landmark objectives of one style against a different style	Chatoupis (2009)
Sadiq Khalid (2004)	Written in a language other than English	Chatoupis (2009)
Abd Al-Salam (2004)	Written in a language other than English	Chatoupis (2009)
Yoncalık (2009)	Written in a language other than English	–
Zeng, Leung, Liu, & Bian (2009)	Teaching style implementation was not systematically verified	–
Hennings, Wallhead, & Byra (2010)	Did not contain the necessary statistics to calculate ES	–
Kolovelonis, Goudas, & Gerodimos (2011)	Teaching style implementation was not systematically verified	–
Chatoupis (2015)	Excluded on statistical grounds (i.e., it represented an outlier)	–

^aThis column indicates which studies the two reviews included.

Given this lack, the question of the effectiveness of the two teaching styles should be readdressed in a manner that statistically combines the results of the relevant studies and makes an objective assessment out of research synthesis. A meta-analytic study can readdress this question by providing a more accurate and valid assessment of a

treatment effect than that provided by narrative reviews (Rosenthal, 1991) and by explaining heterogeneity among the results of individual studies (Egger, Smith, & Phillips, 1997). The validity and the accuracy of the assessment in a meta-analysis are achieved when the researcher identifies, appraises, and synthesizes all of the relevant studies on a particular topic and uses statistical methodologies to derive more objective conclusions than those that typify narrative reviews (Teagarden, 1989; Uman, 2011).

Purpose of the Study

The primary aim of this study was to conduct a meta-analysis to reexamine the effectiveness of the practice and the reciprocal styles on motor skill acquisition (the motor skills tested in the included studies of the meta-analysis are mentioned in Table 2). The present meta-analysis quantifies, summarizes, and presents standardized statistical evidence from all relevant Spectrum studies meeting certain methodological quality levels; it also incorporates evidence from studies not included in the two aforementioned reviews, thus providing a more complete picture on the effectiveness of the two teaching styles.

Based on the two narrative Spectrum reviews and on Spectrum theory, two questions were addressed in this meta-analysis: (a) Will the two teaching styles have moderate to large effects on motor skill acquisition? (b) Given that unlike the practice style, the reciprocal style is designed primarily for developing social and cognitive skills (Mosston & Ashworth, 2008), will the practice style studies yield a larger effect size than the reciprocal style studies?

Method

Identifying Research

The authors undertook a thorough literature search, utilizing valid electronic databases (ERIC, Sport Discus, ISI Web of Science, Google). They searched specific keywords (*Spectrum*, *teaching styles*, *practice style*, *reciprocal style*, *motor skill*) in different combinations to identify relevant data-based Spectrum research published from 1970 to October 2016.

The first priority of an effective school PE program is to provide children with the motor skills needed to be enthusiastic participants

in physical activities and be inclined to lead later on, as adults, a physically active lifestyle (Rink & Hall, 2008; Solmon, 2003). Therefore, given the educational importance of motor skill development, we focused on studies investigating the effects of the practice and reciprocal styles of teaching on motor skill learning outcomes only.

The intention to include the practice and reciprocal styles in the meta-analysis was dictated by two facts. First, both teaching styles have been investigated more often than any other teaching style from the Spectrum (Chatoupis, 2010a, 2015; Chatoupis & Vagenas, 2017). Thus, the ensuing pool of data would be large enough to provide a source of generalizable and meaningful information and for statistical testing. Second, a systematic literature review on PE teachers' use of teaching styles revealed that the practice and reciprocal styles of teaching are used internationally more often in the classroom than any other teaching style (Chatoupis, in press). Therefore, giving a more comprehensive answer to the question on the effectiveness of the two teaching styles will be important to physical educators.

Only studies published in peer-reviewed journals were considered because the publication of research in a journal includes a peer-review process and that suggests a more unbiased, professional investigation and presentation. Therefore, dissertations and research papers published in books and conference proceedings were excluded. After the completion of the search, the reference lists of the identified papers were also checked for additional relevant studies. This search led to 23 relevant published studies.

Inclusion Criteria

We used several criteria to select studies for inclusion in the meta-analysis. We, thus, retained for further analysis only studies written in English, conducted only in educational settings (schools, colleges), employed a pre-post design, used systematic observation to verify fidelity of teaching styles implementation, and contained proper statistics (e.g., means, standard deviations, and sample sizes) for the calculation of the effect size.

In addition to the above criteria, all included studies had to be free of conceptual flaws that invalidate Spectrum research (Chatoupis, 2010b), namely, noncompliance to Spectrum theory (ignoring the decision patterns and comparing the landmark objectives of one style against a different style), inappropriate style comparison (reproduc-

tion styles against production styles), and inappropriate subject matter selection (e.g., teach dribbling in basketball with the command style).

Selection Strategy

Initially, the titles of all of the identified studies were read to determine their gross relevance to the meta-analysis. Then we reviewed the abstracts to decide which studies met the inclusion criteria. In cases an inclusion decision could not be made by reading just the abstract, we read the full texts. Based on the above criteria, six of the 23 original research articles were included in the meta-analysis (see Table 2).

Data Analysis

To quantify the effects of the practice and reciprocal styles on motor skill acquisition, we employed Cohen's (1988) standardized difference. Cohen's d was estimated from the reported means, standard deviations, and sample sizes (Morris, 2008). Individual study statistics included unbiased effect size estimates, associated sampling variances (σ^2), 95% confidence intervals, and z scores, the latter as a check for potential outliers.

The calculation of sampling variance for each effect size requires estimating the pre–post correlation or the standard deviation of the difference scores. However, neither of these two statistics is reported in the relevant studies. Therefore, we had to estimate it by means of one of three available methods: (a) impute the variance of change (score difference) as $\sigma_{\Delta}^2 = \sigma^2(1 - \rho)$ and then compute the pre–post correlations as $\rho = (\sigma_{\Delta}^2 - \sigma^2) / \sigma^2$ (Follmann, Elliott, Suh, & Cutler, 1992); (b) perform a sensitivity analysis using a range of correlation estimates from related studies; or (c) use some plausible approximations of real pre–post correlation values (Borenstein, Hedges, Higgins, & Rothstein, 2009).

Given the difficulty in imputing good approximations of the variance of pre–post change, we chose the second method. Specifically, recalculations from Chatoupis' (2015) and Chatoupis and Vagenas' (2017) studies resulted in pre–post correlation values of 0.707 and 0.775 for the two treatment groups, respectively, and 0.98 for the control group. Also, from similar recalculations from Kolovelonis and Goudas' (2012) study, these pre–post correlation values were

Table 2
Characteristics of Studies Included in the Meta-Analysis (n = 6)

Author (Year)	Journal	Teaching styles	Skills tested	Duration	Research design	Outcome measurements	n	Grade
Goldberger, Gerney, & Chamberlain (1982)	<i>Research Quarterly for Exercise and Sport</i>	Style B, Style C	Hockey accuracy	1 lesson	PP-EG	Score (points)	96	5 th
Beckett (1990)	<i>Journal of Teaching in Physical Education</i>	Style B	Soccer ball juggling	1 lesson	PP-EG	Score (points)	120	College (18–22)
Boyce (1992)	<i>Journal of Teaching in Physical Education</i>	Style B, Style C	Shooting accuracy	6 lessons	PP-EG	Score (points)	135	College (18–23)
Ernst & Byra (1998)	<i>The Physical Educator</i>	Style C	Soccer ball juggling	8 lessons	PP-ECG	Score (points)	60	6 th –9 th
Kolovelonis & Goudas (2012)	<i>Educational Research and Evaluation</i>	Style C	Chest pass accuracy	1 lesson	PP-ECG	Score (points)	48	5 th –6 th
Chatoupis & Vagenas (2017)	<i>The Physical Educator</i>	Style B	Soccer dribbling	8 lessons	PP-ECG	Time (s)	60	5 th

Note. PP-EG = pretest–posttest equivalent group (randomization without control group); PP-ECG = pretest–posttest equivalent control group (randomization with control group). Style B is the practice style. Style C is the reciprocal style. PP-EG = pre-post test equivalent group; PP-ECG = pre-post test equivalent control group.

0.60 for the whole sample and 0.90, 0.70, 0.62, and 0.73 for the four treatment groups, respectively (reciprocal style group, self-check style group, sequential use of the reciprocal and self-check styles group, and control group). Thus, we estimated that pre–post correlations in studies dealing with the effectiveness of PE teaching styles are around a median value of 0.75 and may vary between 0.60 to 0.90.

Based on the above results, we then performed a sensitivity analysis using cutoff values of 0.60, 0.65, 0.70, 0.75, 0.80, 0.85, and 0.90 as a fixed range of plausible correlations to calculate the likely range of sampling variance for the effect size of each study (Morris, 2008). We then calculated the mean effect size for each teaching style as $\text{Mean } d = \Sigma(d / \sigma_d^2) / \Sigma(1 / \sigma_d^2)$, with d being the effect size and σ_d^2 the sampling variance of d . Last, using Hedges and Olkin's (1985) formula, we calculated the sampling variance of the mean effect size as $\sigma_{\text{mean } d}^2 = 1 / \Sigma(1 / \sigma_d^2)$ and the 95% confidence intervals of the mean effect size as $95\% \text{ CI} = \text{Mean } d \pm [(1.96)\sqrt{\sigma_{\text{mean } d}^2}]$.

The present meta-analysis combined studies that were diverse in sample size, study design, and unit of measurement. Therefore, we performed a test of heterogeneity using Cochran's Q test statistic (Hedges, 1981) and the derived I^2 criterion (Higgins, Thompson, Deeks, & Altman, 2003). I^2 estimates the percentage of total variation across studies that is due to heterogeneity rather than chance, and it can be used to compare meta-analyses of different sizes, types of study, and types of outcome data (Higgins et al., 2003).

Results

Individual and Overall Effect Sizes

Cohen (1988) proposed a 3-point scale of 0.20, 0.60, and 0.80 for small, moderate, and large effect size. Based on these effect size thresholds, our results showed that for all of the studies, the practice and reciprocal styles had a large effect on students' motor skill acquisition (mean $d > 0.80$; see Tables 3 and 4).

Table 3

Descriptive Statistics of Effect Sizes (Cohen's d) for the Practice Style Studies

Study	Unbiased	95% CI		z
	ES d	LL	UL	
Goldberger et al. (1982)	0.88	0.50	1.26	-2.55
Beckett (1990)	1.01	0.60	1.42	-1.34
Boyce (1992)	1.52	1.10	1.92	3.28
Chatoupis & Vagenas (2017)	1.39	0.80	1.97	2.12

Note. ES = effect size; CI = confidence intervals; LL = lower limit; UL = upper limit. The z scores were based on the unbiased ES.

Table 4

Descriptive Statistics of Effect Sizes (Cohen's d) for the Reciprocal Style Studies

Study	Unbiased	95% CI		z
	ES d	LL	UL	
Goldberger et al. (1982)	0.85	0.22	1.40	-0.78
Ernst & Byra (1998)	0.81	0.60	1.42	-1.13
Boyce (1992)	1.09	0.75	1.44	1.37
Kolovelonis & Goudas (2012)	0.81	0.15	1.47	-1.15

Note. ES = effect size; CI = confidence intervals; LL = lower limit; UL = upper limit. The z scores were based on the unbiased ES.

The same results were yielded from the synthesis of all practice and reciprocal style studies (see Table 5). Based on Table 5, it appears that the practice style has a larger effect (mean $d = 1.16$ to 1.14) than the reciprocal style (mean $d = 0.94$ to 0.91) on motor skill acquisition.

Table 5*Descriptive Statistics of Effect Sizes (Cohen's d)*

Teaching style	Mean d	Median d	Variance σ^2	95% CI of d
Practice	1.16–1.14	1.15	0.012–0.006	[0.94, 1.37]–[0.98, 1.30]
Reciprocal	0.94–0.91	0.93	0.013–0.006	[0.72, 1.16]–[0.077, 1.06]

Note. These statistics correspond to a series of pre–post correlations ranging from 0.60 to 0.90.

Test of Heterogeneity

Higgins et al. (2003) assigned adjectives of low, moderate, and high to I^2 values of 25%, 50%, and 75%, whereas Perera and Heneghan (2009) argued that an I^2 higher than 50% is deemed to be large enough to question whether combining studies is valid. Based on these practical guidelines, our heterogeneity analysis (see Table 6) showed that the practice style studies had moderate to high heterogeneity, whereas the reciprocal style studies had nearly zero heterogeneity; according to Higgins et al., negative I^2 values are put equal to zero. It is worth noting that none of the computed Cochran's values were statistically significant, which is an indication of consistency in the results of the study.

Table 6*Heterogeneity Statistics of the Meta-Analysis*

Teaching style	Cochran's Q			I^2 statistic	
	M	Mdn	p	M	Mdn
Practice	6.14–10.85	7.78	0.29–0.05	51.11–72.34	61.42
Reciprocal	1.30–2.70	1.75	0.93–0.75	-130.82 – -10.97 ^a	-71.83

Note. These statistics correspond to a series of pre–post correlations ranging from 0.60 to 0.90.

^aNegative I^2 values indicate zero heterogeneity (Higgins et al., 2003).

Discussion

The purpose of this meta-analytic study was to determine the extent to which the practice and reciprocal styles of teaching had a differential effect on motor skill acquisition of K–12 and college students (the motor skills tested in the reviewed studies are presented

in Table 2). Based on selection criteria, six published studies were identified. All included articles were published between 1982 and October 2016.

The message from the meta-analysis on the effectiveness of the two teaching styles is clear. The practice and reciprocal styles of teaching have definite positive effects on motor skill acquisition. Based on Cohen's (1988) scale, the effect sizes were assessed as large (see Tables 3, 4, and 5). These results are consistent with the findings of the two narrative reviews of Spectrum research (i.e., Byra, 2000; Chatoupis, 2009).

Both reviews found that the two teaching styles in question are effective in promoting motor skill acquisition of K–12 or college students over a period ranging from 1 day to a few weeks. However, these reviews did not undertake a quantification and synthesis of the respective effect sizes per study and teaching style. Therefore, until recently the size of these positive effects was unknown to PE teachers and researchers. The present meta-analysis remedies this lack of knowledge.

The above results are consistent with Spectrum theory, according to which the two styles under study can achieve substantial motor skill gains. Mosston and Ashworth (2008) claim that the practice style provides conditions that foster motor skill learning, namely, decision-making opportunities and opportunities for increased practice time. Also, learners learn motor skills in the reciprocal style of teaching by observing the performance, comparing the performance against criteria, and giving appropriate feedback. It seems that increases in learner achievement are related to the increase of opportunities to respond and provision of specific feedback (Jackson & Dorgo, 2002; Maheady, 1998), which are conditions fostered in the reciprocal style.

Although the practice and reciprocal styles of teaching differ on several points and have been studied in distinct ways, the meta-analysis reported similar results for both styles. However, the effect of the practice style was stronger than that of the reciprocal style (see Table 5). This finding is not without justification. The practice style is ideal for learning the specific task at hand, because of the maximum amount of practice time that this style provides (Goldberger, 1984). On the contrary, although the reciprocal style

provides conditions for learning motor skills, particularly in the early stages of learning and in learning the technique of the skill, the landmark objectives of this style are developing social and cognitive skills (Mosston & Ashworth, 2008).

Although the present meta-analysis contributes to the literature on the practice and reciprocal styles of teaching, it is not without limitations. First, we searched only English language journals, and this may have resulted in missing relevant research. Second, the included studies had been conducted in the United States and in Greece, and this limits the possibility of generalizing the findings to other areas of the world. Third, none of the studies reported effect size, and some of them did not provide the necessary statistics to calculate it. Unfortunately, scholarship's call to report effect size (Franks & Huck, 1986; McBride & Xiang, 2009; Thomas, Salazar, & Landers, 1991) has not been heard by the pedagogical community. Fourth, although random assignments of participants to groups were employed in all included studies, three of them did not use a control group (see Table 2). Fifth, although the meta-analysis indicated that both teaching styles are effective in promoting motor skill acquisition even when the duration of the fieldwork was just one lesson, the retention of such an acquisition remains unclear; none of the included studies collected follow-up information. Sixth, a moderator variable is a factor that can change the strength of the relationship between an independent and a dependent variable (Baron & Kenny, 1986). Such moderators were not considered in this meta-analysis because of the small number of the included studies. Seventh, the variations in the included studies regarding motor skill tested, the study sample (age, ethnicity), study design (duration of fieldwork, use of control group), and unit of measurement illustrate the heterogeneity among studies. Although a test of heterogeneity was computed (see Table 6), Thomas and French (1985) claim that combining studies with such diversity is a common critique of meta-analyses.

In conclusion, our meta-analysis provides a synthesis of practice and reciprocal style research targeting K–12 and college students and highlights the effectiveness of these styles of teaching. Overall, both teaching styles had a large effect on motor skill acquisition, which corroborates the findings of individual relevant Spectrum studies.

The findings of this meta-analysis support further the place of the two teaching styles in the teaching repertoire of physical educators and their role in promoting gains in the psychomotor domain.

Physical educators who are interested in developing their students' motor skill learning are encouraged to use both teaching styles in their daily lessons. Given that the practice and reciprocal styles dominate the classrooms (Chatoupis, *in press*) and motor skill learning is a major aim of PE at schools (Chatoupis, 2010a), this study augments the importance of teachers being familiar with them and using them in the gymnasium.

Although the practice style is ideal for promoting motor skill acquisition (Mosston & Ashworth, 2008), the results of the meta-analysis also point to the reciprocal style as a viable option for generating large effects in motor skill learning. The reciprocal style is designed primarily for developing cognitive and social skills (Mosston & Ashworth, 2008); the results indicate that physical educators can use it to achieve gains in motor skills, as well. The findings not only support certain tenets of Spectrum theory with respect to the practice and reciprocal styles (e.g., the merit of decision-sharing opportunities for students), but also encourage physical educators to use the two reproduction teaching styles for realizing certain objectives in the psychomotor domain.

Future meta-analyses should include and assess studies written in languages other than English, combine studies that focus on other teaching styles and learning outcomes, and consider possible moderators. The task of conducting meta-analysis becomes easier when the effect size estimate is reported. Therefore, future research should report the effect size or at least provide proper descriptive statistics including the pre–post correlation that is needed to estimate individual study and overall sampling variance, as well as to perform a heterogeneity analysis. Many scholars, as well as the American Psychological Association (2010), have recommended reporting the effect size (Frohlich, Emrich, Pieter, & Stark, 2009; McBride & Xiang, 2009; Thompson, 2009). Also, authors of future studies should indicate if the effects are meaningful according to established criteria (i.e., Cohen, 1988).

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